



Florent Brient

Associate Professor

Boundary-layer physics, cloud processes and feedback, climate change

Research experience

- Nov. 2020- **Associate Professor**, *Sorbonne Université/Laboratoire de Météorologie Dynamique*, Paris, France
Boundary layer dynamics, cloud feedbacks, atmospheric modeling
- 2018-2020 **Post-doc**, *CNRM/Météo-France*, Toulouse, France
Analysis of convective boundary layer dynamics and development of parameterizations using the Méso-NH model. ANR HIGH-TUNE Project. Supervision by Drs. Fleur Couvreur, Catherine Rio, and Rachel Honnert.
- 2016-2017 **Post-doc**, *CNRM/Météo-France*, Toulouse, France
Evaluation of low clouds simulated by the CNRM global model. European project PREFACE. Supervision by Drs. Romain Roehrig and Aurore Voldoire.
- 2013-2016 **Post-doc**, *ETH*, Zurich, Switzerland
Physical mechanisms for explaining cloud feedbacks in climate models (CMIP5), a high-resolution LES model (PyCLES), and observations (CERES, Calipso). Supervision by Prof. Tapio Schneider.
- 2012-2013 **Post-doc**, *UCLA*, Los Angeles, USA
Study of the robustness of cloud feedback mechanisms in CMIP5 models. Supervision by Prof. Alex Hall.
- 2008-2012 **PhD Student**, *LMD*, Paris, France
Thesis co-funded by CNES/Météo-France titled "Study of the response of tropical clouds to warming simulated by climate models"
Supervision by Dr. Sandrine Bony
- 2008 **Research Internship**, *LMD*, Paris, France
Study of cloud processes in the LMDz model in aquaplanet mode. Supervision by Dr. Sandrine Bony.
- 2007 **Research Internship**, *LA*, Toulouse, France
Calculation of turbulent kinetic energy dissipation using airborne measurements. Supervision by Dr. Pierre Durand.

Studies

- 2008-2012 **PhD in Atmospheric Physics**, *LMD*, Paris, France
- 2007-2008 **Master's Degree 2 Ocean, Atmosphere, Climate, and Remote Sensing**, *UPMC*, Paris, France

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- 2006-2007 **Master's Degree 1 Atmospheric Sciences**, *Paul Sabatier University*, Toulouse, France
- 2005-2006 **Bachelor's Degree in Physics**, *University of Rennes 1*, Rennes, France
- 2003 **Scientific Baccalaureate**, *Dupuy de Lôme High School*, Lorient, France

Publications

- 2024 **Observation-constrained projections reveal longer-than-expected dry spells**, *I. Petrova, D. Miralles, F. Brient, M. Donat, S. Min, Y. Kim, M. Bador*, *Nature*, [\[PDF\]](#)
- **Coherent subsiding structures in large-eddy simulations of atmospheric boundary layers**, *F. Brient, F. Couvreur, C. Rio, R. Honnert*, *QJRM*, [\[PDF\]](#)
- 2023 **Tropical Marine Low Clouds: Feedbacks to Warming and on Climate Variability**, *T. A. Myers, R. Vogel, F. Brient, H. Parishani and R. C. Scott*, AGU Monograph "Clouds and Their Climatic Impacts: Radiation, Circulation, and Precipitation, chapter 7, 159-177.", [\[PDF\]](#)
- 2021 **Tracking Changes in Climate Sensitivity in CNRM Climate Models**, *D. Saint-Martin, O. Geoffroy, A. Voldoire, J. Cattiaux, F. Brient, F. Chauvin, M. Chevallier, B. Decharme, C. Delire, H. Douville, J.-F. Guérémy, E. Joetzer, A. Ribes, R. Roehrig, L. Terray and S. Valcke*, *JAMES*, [\[PDF\]](#)
- 2020 **The potential for structural errors in emergent constraints**, *B. Sanderson, A. Pendergrass, c. D. Koven, F. Brient, B. B. Booth, R. A. Fisher and R. Knutti*, *Earth System Dynamics*, [\[PDF\]](#)
- **Process-based climate model development harnessing Uncertainty Quantification. Part I: a new paradigm for parameterization improvement**, *F. Couvreur, F. Hourdin, D. Williamson, ... F. Brient ... Q. Rodier*, *JAMES*, [\[PDF\]](#)
 - **Reducing uncertainties in climate projections with emergent constraints: Concepts, Examples and Prospects**, *F. Brient*, *Adv Atmos Sci.*, [\[PDF\]](#) [\[News1\]](#) [\[News2\]](#)
- 2019 **Controls on the water vapor isotopic composition near the surface of tropical oceans and role of boundary layer mixing processes**, *C. Risi, J. Galewsky, G. Reverdin and F. Brient*, *Accepted to Atm. Chem. and Phys.*, [\[PDF\]](#)
- Unified parameterization of convective boundary layer transport and clouds with the thermal plume model**, *Hourdin F., A. Jam, C. Rio, F. Couvreur, I. Sandu, M.P. Lefebvre, F. Brient and A. Idelkadi*, *Publié dans JAMES*, [\[PDF\]](#)
- Object-oriented identification of coherent structures in large-eddy simulations: Importance of downdrafts in stratocumulus**, *F. Brient, F. Couvreur, N. Villefranque, C. Rio and R. Honnert*, *Publié dans Geophys. Res. Lett.*, [\[PDF\]](#)
- Evaluating marine stratocumulus clouds in the CNRM-CM6-1 model using short-term hindcasts**, *F. Brient, R. Roehrig and A. Voldoire*, *Publié dans JAMES*, [\[PDF\]](#)
- 2018 **Relation of seasonal and regional aspects of the double-ITCZ bias in CMIP5 models to the atmospheric energy budget**, *Adam O., T. Schneider and F. Brient*, *Clim. Dyn.*, [\[PDF\]](#)

- 2017 **On the dependence of cloud feedbacks on physical parameterizations in WRF aquaplanet simulations**, Cesana G., K. Suselj and F. Brient, *Geophys. Res. Lett.*, [\[PDF\]](#)
- The Cloud Feedback Model Intercomparison Project (CFMIP) Diagnostic Codes Catalogue**, Tsushima Y., F. Brient, S. A. Klein, D. Konsta, C. Nam, X. Qu, K. D. Williams, S. C. Sherwood, K. Suzuki and M. D. Zelinka, *Geosci. Model Dev. Discuss*, [\[PDF\]](#)
- Cloud feedback mechanisms and their representation in global climate models**, Ceppi P., F. Brient, M. Zelinka and D. Hartmann, *WIREs Climate Change*, [\[PDF\]](#)
- Climate goals and computing the future of clouds**, Schneider T., J. Teixeira., C. S. Bretherton, F. Brient, K. G. Pressel, C. Schär and A. P. Siebesma., *Nature Clim. Change*, [\[PDF\]](#)
- 2016 **Réduire les incertitudes des projections climatiques: le rôle des contraintes émergentes**, Brient F., *La Météorologie*, [\[PDF\]](#)
- **Relation of the double-ITCZ bias to the atmospheric energy budget in climate models.**, Adam O., T. Schneider, F. Brient and T. Bischoff, *Geophys. Res. Lett.*, [\[PDF\]](#)
 - **Constraints on climate sensitivity from observed low-cloud reflection**, Brient F. and T. Schneider, *Journal of Climate*, [\[PDF\]](#)
 - **Shallowness of tropical low clouds as a predictor of climate models' response to warming**, Brient F., T. Schneider, Z. Tan, S. Bony, X. Qu and A. Hall, *Clim. Dyn.*, [\[PDF\]](#)
- 2013 **CGILS: First Results from an International Project to Understand the Physical Mechanisms of Low Cloud Feedbacks in General Circulation Models**, Zhang M. H. and 40 co-auteurs, *J. Adv. Model. Earth Syst.*, [\[PDF\]](#)
- **Interpretation of the positive low-cloud feedback predicted by a climate model under global warming**, Brient F. and S. Bony, *Clim. Dyn.*, [\[PDF\]](#)
- 2012 **How may low-cloud radiative properties simulated in the current climate influence low-cloud feedbacks under global warming?**, Brient F. and S. Bony, *Geophys. Res. Lett.*, [\[PDF\]](#)
- **The CGILS experimental design to investigate low cloud feedbacks in general circulation models by using single-column and large-eddy simulation models.**, Zhang, M., C. S. Bretherton, P. N. Blossey, S. Bony, F. Brient, and J.-C. Golaz, *J. Adv. Model. Earth Syst.*, [\[PDF\]](#)
 - **Evaluation of cloud and water vapor simulations in CMIP5 climate models using NASA "A-Train" satellite observations**, Jiang, J.H. et 29 co-auteurs, *J. Geophys. Res.*, [\[PDF\]](#)

Scientific Responsibilities

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- 2017... **Member of the scientific steering committee** of the CFMIP (Cloud Feedback Model Intercomparison Project)
- 2023 **Lead organizer** of the CFMIP-GASS conference at Sorbonne University (Paris, France) [[Website](#)]
- 2021 Post-doc project reviewer for NASA
- 2021 **Lead organizer** of the online CFMIP 2021 conference [[Website](#)]
- 2016–2018 **Lead organizer** of a special session "Cloud processes and cloud feedback in models and observations" at the EGU General Assembly (3 times).
- August 2017 Participation in the AEROCLO-SA measurement campaign (August 2017) in Namibia. Study of Namibian climate, preparation of weather forecasts
- 2015 Co-organizer of a special session "The hydrological cycle under past, present, and future climate change" at the EGU General Assembly.

Funding

- 2023-2027 Principal Investigator (PI) of the ANR Young Researchers (JCJC) project MOBYDYC (Morphology Of stratocumulus, BoundarY-layer DYnamics, and Climate Change) - 357,000 €
- Since 2022 Participant in the CNES EMC-Sat project (Satellite Observation Analysis for Climate Study and Modeling) - 40,000 €/year

Committee

- 2023-2024 PhD thesis advisor committee , Adrien Marcel (CNRM)
- 2022 PhD thesis examiner member, Anna Lea Albright (LMD)

Educational Experience

- Courses
 - L1: Earth, Climate, Environment (LU1ST021) - Lab work (TP)
 - L2 Earth Sciences: Meteorology (LU2ST045) - Lab work (TP)
 - L3 Physics: Ocean, Atmosphere, Renewable Energies (LU3PY234) - Lectures
 - L3 Earth Sciences: Geosciences and Environmental Issues (LU3ST616) - Lectures
 - L3 Polytech Sorbonne: Environmental Transition - Lectures
 - M1 MOCIS: Statistics and Data Processing (M14UE001) - Lab work (TP)
 - M1 MOCIS: Physics of the Ocean and Atmosphere (M14SCA06) - Lectures on Atmospheric Boundary Layer
- Responsibilities
 - UE Physics: Ocean, Atmosphere, Renewable Energies (Physics Bachelor's Degree) - Course Coordinator
 - UE Geosciences and Environmental Issues (Earth Sciences Bachelor's Degree) - Co-coordinator
 - Dual-discipline Students in Earth Sciences Bachelor's Degree - Advisors
 - L4 Students (Track to obtain an Earth Sciences Bachelor's Degree after a Major/Minor track) - Monitoring Coordinator

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Supervision

- 2024-2027 Emma Monnier - PhD, ENS (CDSN) - "Characterization of low-cloud organization observed by satellites"
- 2024-2027 Antoine Serres - PhD, ANR MOBYDYC - "Analysis of atmospheric boundary layer organization by the Rayleigh-Bénard convection in high-resolution simulations (LES)"
- 2024 Eloi Colliau - L2 Internship, Université PSL - "Organization of the atmospheric boundary layer in high-resolution simulations"
Emma Monnier - M2 Internship, Sorbonne Université/ENS - "Study of stratocumulus morphologies in satellite observations"
- 2023 Julien Sant-Anna - M2 Internship, Sorbonne University - "Organization of the atmospheric boundary layer in high-resolution simulations"
- 2021 Rayan Samy Ramoul - M2 Internship, Sorbonne University - "Contribution of various artificial intelligence techniques for classifying low-cloud spatial organizations"
- 2019 Tristan Amm, Thomas Goudeau, and Nicolas Roux - Study Internship, Modeling Innovation (EMI), National School of Meteorology (ENM) - "Modeling and study of dry air intrusions"

Invited conferences

- 2024 Workshop "Interfaces in the climate system" within the annual meeting 2024 of GDR 'Défis théoriques pour les sciences du climat', Grenoble, France
- 2024 Danmarks Meteorologiske Institut Seminar, Copenhagen, Denmark
- 2018 Imperial College Seminar, London, United Kingdom
- 2018 ECMWF Seminar, Reading, United Kingdom
- 2018 University of Reading Seminar, Reading, United Kingdom
- 2018 University of Exeter Seminar, Exeter, United Kingdom
- 2016 Laboratoire de Météorologie Physique Seminar, Clermont-Ferrand, France
- 2016 Laboratoire d'Optique Atmosphérique Seminar, Lille, France
- 2016 Laboratoire d'Aérodynamique Seminar, Toulouse, France
- 2016 Centre National de Recherches Météorologiques Seminar, Toulouse, France
- 2014 Max Planck Institute for Meteorology Seminar, Hamburg, Germany
- 2013 National Center for Atmospheric Research Seminar, Boulder, USA

Awards

- 2014 Certificates of Excellence for Presentations at the 7th GEWEX conference (The Hague, Netherlands)

Scientific Communication

- 2023... Videos of 2D boundary-layer dynamics with the Meso-NH Model [\[Youtube\]](#)
- 2016... Scientific outreach: Blog posts, Twitter account [@FlorentBrient](#)

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2016 Publication in the French journal La Météorologie aimed at the general public